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ABSTRACT

Designed for a two-year course of study, this syllabus encompasses six areas of the masonry trade: concrete, block, brick, stone, tile, and plaster. For each area, the separate units of instruction contain course content outline, student behavioral objectives, and suggested teaching methods and audiovisuals. The six sections and their units are as follows: (1) Concrete Work (Job Statistics, Concrete Components, Reinforcement, Preparation of Common Mixes, Placing Concrete, Finishing Procedures, Pre-cast Concrete, Blueprints, Specifications, Estimating); (2) Block Work (Job Statistics, History of Block, Block Types and Sizes, Properties of Block Walls, Mortar, Concrete Block Walls, Special Purpose Block, Blueprints, Specifications, Estimating); (3) Brick Work (Job Statistics, History of Brick, Brick Manufacture, Safety, Mortar, Laying Brick, Walls [Design Characteristics, Laying Corners, Wall Openings, Piers and Pilasters, Expansion and Control Joints], Flashings, Arches, Brick Steps, Fireplaces and Chimneys, Brick Paving, Washing and Cleaning, Blueprints, Specifications, Estimating, Miscellaneous Operations, Terminology); (4) Stone Work (Job Statistics, History of Stone Work, Quarrying, Stone Classification, Properties of Stone, Common Uses and Patterns, Setting Stone, Washing and Cleaning, Blueprints, Specifications, Estimating); (5) Tile Work (Job Statistics, History of Tile, Glazed Tile, Architectural Terra Cotta, Facing Tile, Miscellaneous Types, Blueprints, Specifications, Estimating); and (6) Plaster Work (Job Statistics, History of Plastering, Preparation of Plaster, Application, Blueprints, Specifications, Estimating). The appendix includes a list of texts, references, and audiovisuals, a list of suggested tools and equipment, and an audiovisuals source directory. (JH)

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TRADE MASONRY

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SYLLABUS

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FOREWORD

This syllabus in *Trade Masonry* encompasses six areas of the trade. It is designed principally as a distinct two-year course of study for those students wishing to obtain employment in the mason's trade. In three-year programs it may also be used as an indepth masonry course, subsequent to the first year of a Building Industries Occupations course, to those students well motivated toward this specialization. Where only the Building Industries Occupations course is offered, selected content of this *Trade Masonry* syllabus may be added to the masonry section of that course of study, to enrich the experiences of those students who could benefit by the concentration.

Early in 1971 several teachers of trade masonry, of recognized competence, were contacted regarding formulation of a syllabus. During that summer a committee composed of Richard Coyle, Ulster BOCES, Edward Keon, Northern Westchester BOCES, and Santo Palmano, Utica Free Academy, met with Charles Stebbins, associate, Bureau of Trade and Technical Education, and Joseph Messier, associate in vocational curriculum, Bureau of Secondary Curriculum Development. The resulting first draft was organized and performance objectives were written by Mr. Messier, the project coordinator. This copy was then evaluated by the committee and Mr. Stebbins, their suggested changes being incorporated into the final manuscript.

When late in 1977 supply of the original printing was nearly exhausted, G. Earl Hay, Chief of the present Bureau of Occupational Education Curriculum Development, asked Carl G. Benenati, Chief of the Bureau of Trade & Technical Education, to determine whether the publication should be reprinted, revised, or replaced. In the opinion of that Bureau's staff the contents of the 1972 publication are still valid, reliable, and current, and are again available as this *Trade Masonry Syllabus — 1978 Reprint*.

TO THE TEACHER

This syllabus was developed to aid teachers of trade masonry in writing the course of study, and to provide a statewide standard of minimum course content.

Like all syllabuses, *Trade Masonry* is organized in some logical progression which is, however, not necessarily a teaching sequence. The individual teacher is expected to rearrange the content order to accommodate local conditions.

Time segments have been allocated to each of the six trade areas as organized in this syllabus, based on a theoretical average importance. The teacher is expected to modify these allotments to reflect current local conditions, but must maintain the minimum course duration of 2 1/2 hours per day, 160 teaching days, in each of two academic years. The suggested allotments total 80 percent of the course time, thus providing flexibility needed to meet local and individual needs.

The first column of the syllabus format lists units of required course content. Shop and field safety instruction is not specified in this column as distinct units of instruction, since safety instruction is inherently part of *everything* taught and practiced.

The second column sets forth objectives of each unit of instruction. These objectives are stated in terms of *student* behavior rather than teacher behavior for, as trade teachers well know, resulting student abilities are the true criteria of effective instruction. The wording of these *performance objectives* reflects the broad nature of the syllabus. Here too, the teacher is expected to modify —writing tighter objectives which more closely define his specific course of study.

The final column consists of suggested methods and audiovisuals, and means of motivating, intended to assist the teacher and to stimulate his professional ingenuity. It is not prescriptive.

Appended are lists of texts, references, and audiovisuals selected as examples of extant materials, a list of suggested tools and equipment considered minimal for proper instruction, and an A/V source directory.

CONTENTS

	Page
FOREWORD	iii
TO THE TEACHER	iv
 SECTION I, CONCRETE WORK	
Job Statistics	1
Concrete Components	1
Reinforcement	3
Preparation of Common Mixes	3
Placing Concrete	4
Finishing Procedures	5
Pre-cast Concrete	7
Blueprints, Specifications, Estimating	8
 SECTION II, BLOCK WORK	
Job Statistics	9
History of Block	9
Block Types and Sizes	10
Properties of Block Walls	11
Mortar	11
Concrete Block Walls	12
Special Purpose Block	13
Blueprints, Specifications, Estimating	14
 SECTION III, BRICK WORK	
Job Statistics	15
History of Brick	15
Brick Manufacture	16
Safety	17
Mortar	17
Laying Brick	19
Walls — Design Characteristics	21
Laying Corners	22
Wall Openings	23
Piers and Pilasters	23
Expansion and Control Joints; Flashings	24
Arches	25
Brick Steps	25

	Page
Fireplaces and Chimneys	26
Brick Paving	28
Washing and Cleaning	29
Blueprints, Specifications, Estimating	30
Miscellaneous Operations	31
Terminology	32
 SECTION IV, STONE WORK	
Job Statistics	33
History of Stone Work	33
Quarrying	34
Stone Classification	34
Properties of Stone	35
Common Uses and Patterns	36
Setting Stone	37
Washing and Cleaning	39
Blueprints, Specifications, Estimating	40
 SECTION V, TILE WORK	
Job Statistics	41
History of Tile	41
Glazed Tile	42
Architectural Terra Cotta	43
Facing Tile	43
Miscellaneous Types	44
Blueprints, Specifications, Estimating	45
 SECTION VI, PLASTER WORK	
Job Statistics	46
History of Plastering	46
Preparation of Plaster	47
Application	48
Blueprints, Specifications, Estimating	49
 APPENDIX	
Resource List	50
Source Directory	53
Suggested Equipment	55

SECTION I CONCRETE WORK

Suggested Time: 95 Hours

<u>CONTENT</u>	<u>OBJECTIVES</u>	<u>TEACHING SUGGESTIONS</u>
I - 1. JOB STATISTICS		
• Working conditions • Wages and benefits • Concrete mason's duties	The student should be: - Acquainted with standard jobsite conditions. - Acquainted with current local wages and benefits. - Acquainted with the duties of the entry-level concrete mason. - Aware of probable employment prospects.	Films — <i>Futures in Concrete</i> and <i>New Dimensions in Concrete</i> — should be valuable. The student should be required to maintain a notebook.
I - 2. CONCRETE COMPONENTS		
• Cementitious materials — Portland cement; C150, Types I-V — Portland cement, air entraining; C175, Type IA, IIA, IIIA — Portland-Slag cement; C205, Types IS and IS-A — Portland-Pozzolan; C340, Types IP and IP-A	The student should be: - Aware of the availability of various types of cements, each possessing unique properties which are selected according to specific job requirements. - Acquainted with the five commonly used classifications of Portland cement. - Aware that concrete can be successfully placed under water.	It is more important that the student understand why different cements are needed and what they do, than that he memorize a list of types/properties/uses. Film — <i>Inside Story of Concrete</i>, obtainable from U.S. Army — should be valuable.

- Aggregates
 - Coarse sand
 - Stone
 - . Crushed
 - . Washed gravel
 - Prepared aggregates
 - . Lightweight
 - . Heavyweight

The student should be:

- Aware that sand must be clean, sharp, and coarse.
- Acquainted with the various types and sizes of aggregates.
- Aware of the effects of excessive impurities in the mix water.
- Acquainted with the various admixtures available, and with the purposes of each.

Samples of various aggregates should be on display.

The student should understand that geographic location affects availability of specific aggregates.

As a rule-of-thumb — to prevent variation in setting time, strength, color, efflorescence, and steel corrosion — water should be "fit to drink."

- Water
- Admixtures
 - Antifreeze
 - Accelerators
 - Retarders
 - Coloring

The student should be able to:

- Demonstrate by oral or written test, an understanding of the function of cement, aggregate, and water.
- Explain the need for different sizes and types of aggregate, naming those locally available.
- Describe the effects of air entrainment and the properties of concrete which that cement provides.
- List the common admixtures, describing the advantages, disadvantages, and limitations in use of each.
- Describe the jobsite conditions which would dictate use of accelerators and retarders.

The student should be aware of the true nature of so-called antifreezes.

The student must realize that strict adherence to recommended proportions is necessary if admixtures are not to weaken the mix.

I - 3 REINFORCEMENT

• Purpose

The student should be:

Aware of the types of reinforcing commonly used.

Acquainted with the procedures used in installing reinforcing.

The student should be capable of properly installing the few rods and small sections of net which on nonunion jobs are the responsibility of the mason.

• Methods

— Materials

. Rods

. Mesh

— Procedures

The student should be able to:

Describe, orally or in writing, the purpose and function of reinforcing in concrete.

Explain in simple terms why the reinforcing neither breaks loose nor rusts away.

Be sure the student understands the meaning of *tensile strength*, *coefficient of expansion*, and *alkaline*.

I - 4. PREPARATION OF COMMON MIXES

• Requirements

— Size and shape of pour

— Exposure to weather

— Strength

. Compression

. Shear

. Abrasion

The student should be:

Aware that the location, configuration, and intended use of the pour determine the nature and proportion of the components.

Chart #613-54 obtainable from the American Concrete Institute, and the film *Concepts in Concrete*, obtainable from Ideal Cement Co., should be valuable.

• Blending components

— Cement type

— Aggregates

— Aggregate/cement proportion

— Water/cement ratio

Acquainted with the manner in which components are manipulated to provide the required properties.

- Methods of mixing
 - Job mix
 - . Hand
 - . Machine
 - Transit mix

The student should be:

Acquainted with the various methods used to mix concrete.

Aware of the relative cost in materials and labor of the various methods.

Acquainted with the various methods of testing the mix for required consistency.

Emphasize the importance of following the proper sequence in mixing.

- Testing for quality
 - Slump
 - Ball penetration
 - Unit weight
 - Air content

The student should be able to:

Prepare a mix by hand and by stationary mixer of any standard type, the concrete conforming to teacher-supplied specifications.

Perform a slump test to verify conformity of the mix to the specified consistency.

A.C.I. chart #613-54 should be valuable.

I - 5. PLACING CONCRETE

- Preparation
 - Site check
 - . Grade
 - . Forms
 - . Reinforcing
 - . Vapor barrier
 - . Truck access
 - Procedure check
 - . Time of transit arrival
 - . Labor force
 - . Equipment readiness
 - . Weather problems
 - Temperature
 - Rain cover

The student should be:

Aware of the importance of inspecting the condition of the subgrade before concrete is ordered.

Aware of the importance of checking the readiness of forms, reinforcing, and vapor barriers before concrete is on site.

Aware of the importance of having labor and equipment in readiness at the scheduled arrival time to pour, finish, and protect the concrete.

Field trips are of supreme importance where school equipment cannot duplicate field conditions.

While on large jobs this is the responsibility of the construction superintendent, a final inspection by the mason foreman is worthwhile.

Emphasize need to observe temperature limits when heating a mix to prevent flashset.

- Joints
 - Control
 - Expansion
 - Construction

The student should be:

Acquainted with the designation, configuration, and purpose of the various joints in a pour.

Aware of the diamond saw and its use on certain joints.

Emphasize the importance of teamwork within the mason/laborer group engaged in placing concrete.

- Pouring
 - Chute
 - Bucket
 - Conveyor belt
 - Pump
 - Tremie

Acquainted with the common means of placing the concrete in position.

Emphasize those methods which are of local importance.

- Vibrating
 - Manual
 - Immer. on tube

The student should be able to:

Demonstrate by oral or written test, an understanding of the need for joints in large pours, and so describe the constructions used.

Prepare a list of points to be checked before a pour.

Determine the readiness of an actual site and organize for the pour.

Demonstrate by oral or written test, an understanding of the need for and of the effects of too little or too much vibrating.

Properly vibrate an actual pour.

Over the term of the course the student should be involved in all mason's responsibilities during a pour.

Demonstration:

Prepare two forms approximately 6 inches wide by 30 inches high. Dump stiff concrete into one; pour and vibrate the other. Cure, then strip to show presence and absence of "honeycomb."

I - 6. FINISHING PROCEDURES

- Screeding
 - Wet
 - Dry
 - Jitterbugging

The student should be:

Aware of the function of screeding.

Acquainted with the standard methods and equipment, and with the suitability of each to given screeding situations.

- Floating
 - Darby (Bull)
 - Hand
 - Machine

- Troweling
 - Hand
 - Machine

- Edging

- Special finishes
 - Exposed aggregate
 - Broom
 - Textured

- Curing
 - Methods
 - . Moisture replacement
 - . Surface sealing
 - Duration
 - . Ambient temperature
 - . Cement type

- Grinding and filling

- Damp proofing
 - Sealers
 - Bituminous coatings
 - Membrane
 - Polyethylene
 - . Film
 - . Spray

The student should be:
 Aware of the function of floating and troweling.
 Acquainted with the procedures and equipment used for both manual and machine finishing.
 Aware of the purpose of edging and of the tools and procedure used.

The student should be able to:
 Screed, float, and trowel a pour both manually and by machine, the resulting surface conforming to field standards for both float and trowel finishes.

The student should be:
 Aware of the special finishes commonly used in contemporary concrete construction.
 Acquainted with the methods used in attaining these finishes.

The student should be able to:
 Effect a broom finish which conforms to field standards of quality.

The student should be:
 Aware of the need for and function of curing.
 Acquainted with the two methods of curing.
 Aware of the factors affecting the curing time.
 Acquainted with the methods of removing form marks and small voids.
 Aware of the need for damp proofing subterranean concrete in some soils.
 Acquainted with the common methods of damp proofing.

The student should be fully aware of the importance of the floating operation to the quality of the finished surface.

Emphasize that the density of the surface depends upon the number of trowelings.

Samples of various patterns of exposed aggregate finish may be displayed, or examples in the school or home areas may be cited.

Representative samples of textured finishes, together with the plastic form liners which produce them, should be displayed.

Instruction in curing should cover water curing, water retaining, mechanical retaining, and chemical membranes. Emphasis should be placed on the locally important methods.

The student should understand that the ultimate strength of the particular pour is dependent on the curing.

The student should be able to:

Demonstrate by oral or written test, a basic understanding of the effects of curing on the properties of the concrete, and of the manner in which each method provides the desired results.

Select the proper tools and materials, and remove form marks and small voids from the surface of a pour, all work conforming to field standards of quality.

List the common damp proofing methods, and demonstrate by oral or written test a basic knowledge of the properties, uses, and application procedure of each.

Perform all mason work required to damp proof a section of concrete by any teacher-selected methods, all work conforming to field standards of quality.

Whether emphasis is placed on manual or machine grinding of form marks is dependent on the relative local importance of residential/industrial employment.

Emphasize the importance of well-timed teamwork to the finishing of concrete.

I - 7. PRE-CAST CONCRETE

- Units
 - Slabs
 - Beams
 - Structures
 - . Catch basins
 - . Man holes
 - . Septic tanks
 - . Stairs

The student should be:

Aware of the increasing importance of pre-cast concrete units.

Acquainted with the variety of shapes available, and with their properties.

Aware of the advantages inherent in this method of construction, and with its limitations.

Acquainted with the methods of emplacing and unitizing pre-cast units.

While the film, *Building with Prestressed Concrete*, should be valuable, a field trip to a construction site should be scheduled if possible.

No other method equals the effectiveness of a field trip to a concrete casting plant. Audiovisuals may substitute where such a trip is not practicable.

- Type
 - Pre-stressed
 - Pre-tensioned
- Manufacture
- Installation

The student should be able to:

Demonstrate by any teacher-selected means, a basic knowledge of the configuration, construction, properties, and uses of the common pre-cast units. Demonstrate by any teacher-selected means, a basic knowledge of the methods used to set and to fasten the various pre-cast units.

I - 8. BLUEPRINTS, SPECIFICATIONS, ESTIMATING

- Blueprints
 - Plan view
 - Sections
 - Symbols
- Specifications
 - Materials
 - Product quality
- Estimating

The student should be:

Acquainted with the standard plan symbols used to indicate concrete. Acquainted with the manner in which the architect's specifications list and describe the kinds and qualities of concrete.

The student should be able to:

Describe by interpreting teacher-supplied plans, the location of specified sections of concrete. Describe by interpreting teacher-supplied specifications, the kind and quality of concrete required for an indicated section of the structure. Estimate to an accuracy of $\pm 1/2$ yard, the quantity of concrete needed to pour a teacher-designated section of the structure. Write the order for the concrete needed for this pour.

The student should become proficient with symbols and specs through constant class use rather than by rote.

Opaque projection of sections of plans and specs, especially in conjunction with individual student copies, is an excellent group instruction method.

Students who have difficulty grasping volumetric measurement may be aided by use of 27 wooden cubes 1-inch x 1-inch, assembled to represent 1 cu. ft. of concrete; 1 sq. yd. of concrete, 1 ft. thick; 1 cu. yd. of concrete.

SECTION II BLOCK WORK

Suggested Time: 100 Hours

<u>CONTENT</u>	<u>OBJECTIVES</u>	<u>TEACHING SUGGESTIONS</u>
II - 1. JOB STATISTICS		
• Working conditions • Wages and benefits • Job market	The student should be: - Acquainted with standard jobsite conditions. - Acquainted with current local wages and benefits. - Aware of probable employment prospects. <i>The student should be able to:</i> - Demonstrate by oral or written test, a working knowledge of the duties of the entry-level block mason.	<i>Opaque projection</i> of newspaper "want ads," union literature, and Labor Department projections should be of value. The teacher must attempt complete objectivity when discussing relative strengths and weaknesses of union and nonunion employment.
II - 2. HISTORY OF BLOCK		
• Origin • Development • Terminology	The student should be: - Aware of the conditions which led to the creation of block. - Acquainted with the processes in block manufacture. <i>The student should be able to:</i> - Demonstrate by written or oral test, and by day-to-day use, a working knowledge of standard trade terms.	It is not necessary that the student be tested on this background information. Field trip to block manufactory should be valuable. Terminology should be learned by use rather than by rote.

II - 3. BLOCK TYPES AND SIZES

- Aggregates
 - Lightweight
 - Heavyweight
- Construction
 - Solid
 - Hollow
- Dimensions
 - Sizes
 - Shapes
- Finish
 - Colors
 - Textures
- Standards
 - Specifications
 - Codes

The student should be:

Aware of the existence of a broad variety of block, differing in composition and structure as well as in size and appearance.

Acquainted with the specific uses of the more common varieties of block.

Aware of the modular organization of block sizes.

Aware of the existence of strength standards for block.

The student should be able to:

Demonstrate by written or oral test, a knowledge of the common aggregates and the lightweight or heavyweight classification of each.

Demonstrate by any teacher-specified means, a knowledge of the variety of block available and the standard uses of each.

Determine the block to be used by consulting job specifications.

The student should understand the advantages inherent in a modular system. Be sure that he understands the meaning of modular.

The student need not know A.S.T.M. standards, but should know what A.S.T.M. is and what it does.

At this level it is more important that the student realize the extent of structural, dimensional, and esthetic variations than that he memorize certain examples.

Students who may benefit therefrom should be instructed in determining job specs/building code compatibility.

II - 4. PROPERTIES OF BLOCK WALLS

- Structural strength
 - Compression
 - Wind resistance
- Insulating value
 - Acoustical
 - Thermal
- Condensation control
- Fire resistance

The student should be:

Aware of the relative strength of concrete block walls.

Aware of the general insulating value of concrete block walls.

Acquainted with the ability of concrete block walls to control condensation.

Acquainted with the fire retarding value of concrete block.

Charts and tables of these values are commercially available. These can be screened by *opaque projection* for group instruction in interpretation.

Tape a thermometer to one face of a concrete block. Play a propane torch on the opposite face. Read any difference in the indicated temperature.

II - 5. MORTAR

- Components
 - Cementitious materials
 - . Masonry cement; ASTM C-91, Type II
 - . Portland cement, ASTM C-150, Types I, II, III
 - . Air entraining portland; ASTM C-175, Types IA, IIA, IIIA
 - . Hydrated lime; ASTM C-207, Type S
 - Sand
 - Admixtures

The student should be:

Acquainted with the common cementitious agents used for block-work.

Aware of the properties which each imparts to the mortar.

Aware that sand also must meet specifications.

Acquainted with common admixtures and their effects on the mix.

Aware that mortar which is set by hydration must be discarded, but that a mix which has stiffened through evaporation may be retempered.

Table 15 — Recommended Mortar Mixes, obtainable from the Portland Cement Association, should be of value.

Table 14 — Aggregates for Masonry Mortar, obtainable from the Portland Cement Association, should be of value.

Emphasize sole reliability of elapsed time/ambient temperature means of differentiating between evaporation and hydration.

- Properties
 - Strength
 - Water retention
 - Workability
 - . Retemperability
 - . Plasticity

The student should be able to:

Select specified components, accurately proportioning and properly mixing to obtain a specified amount of mortar.

Demonstrate by written or oral test, an ability to match components with the mortar properties required.

II - 6. CONCRETE BLOCK WALLS

- Service
 - Bearing walls
 - . Basement
 - . Below grade
 - . Floor and roof support
 - Nonbearing walls
- Construction features
 - Bond
 - . Running
 - . Stack
 - . Pattern
 - . Other
 - Pilasters and buttresses
 - Control and expansion joints
 - Wall intersections
 - Cavity walls
 - Bond beams

The student should be:

Aware of the inherent differences in block designed for bearing walls and for nonbearing walls.

Acquainted with the methods of laying bearing and nonbearing walls.

Acquainted with the method of damp proofing below grade walls.

Familiar with the appearance of common bonds, and with the layout of each.

Aware of the purpose of pilasters and buttresses.

Aware of the purpose of control and expansion joints, and acquainted with the methods and materials used in their construction.

Acquainted with the methods of constructing wall intersections.

Aware of the purpose of cavity walls, and acquainted with the method of construction.

Acquainted with the need for and use of bond beams.

Emphasize the importance of building weathertight walls.

Emphasize that pattern bonds are acceptable structurally only where ties are incorporated.

Samples of joint materials should be displayed.

Use of metal ties as well as bonding should be taught.

Emphasize use of thermal insulation and reinforcement during construction.

- Lay up
 - Laying up block
 - . Full bedding
 - . Face shell bedding
 - Cutting and dressing
 - . Hand
 - . Machine
 - Back up
 - Openings in walls
 - . Maintaining dimensions
 - . Lintels
 - . Flashing
 - Reinforcing
 - Attaching anchors
 - Jointing and finishing

- Repair and tuck-pointing

The student should be able to:

Lay up any specified bond straight, level, and plumb, joints conforming to field standards of uniformity.

Cut and dress block on length and on height to an accuracy of $\pm 1/4$ inch by hand, and to $\pm 1/8$ inch by machine.

Lay up backup courses straight and true, securely bonded to face veneer.

Lay up openings in a wall as required by a furnished plan, the product conforming to field standards of quality.

Install reinforcing and hardware to field standards of quality.

Iron, sponge float, and polish joints.

Point up defects in joints both before and after mortar has set.

Emphasize the importance of teamwork in attaining efficient lay up of block.

Eye and lung protective devices *must* be used.

Students should be aware that properly done backup is still more rapidly laid up than is face veneer.

Emphasize the importance of maintaining plumb, square, and true dimensions.

Emphasize importance of *exact* placement of anchors.

Emphasize need to force mortar against a suitable backstop.

II - 7. SPECIAL PURPOSE BLOCK

- Common types
 - Access
 - . Manholes
 - . Catch basins
 - Split
 - . Exposed aggregate
 - . Fluted
 - Shadowal
 - Spectraglaze
 - Slope paving
 - Filler-block floors
 - Patios
 - Ornamental screen

The student should be:

Acquainted with the various commonly used special purpose block.

Aware of peculiarities and limitations in use of each type.

Acquainted with the processes required for lay up of each type.

The student should be able to:

Select specific special purpose block from a representative sample.

Associate by any teacher-specified means, each common special purpose block with its uses.

The films, *Concrete Masonry Slope Paving Under Bridges; Design Data On Concrete Joist-Concrete Filler Block Floors; Shadowal Construction Masonry*, should be of value.

Emphasize the need for gentle handling of spectraglaze block.

- Lay up

The student should be able to:

Lay out for, and lay up any specified special purpose block, all work conforming to entry-level standards of quality.

II - 8. BLUEPRINTS, SPECIFICATIONS, ESTIMATING

- Blueprints
 - Reading
 - Sketching
- Specifications
- Estimating materials
 - Block
 - Mortar components
- Estimating labor (optional)

The student should be able to:

Locate on the prints and in the specs, any teacher-specified unit of work. Derive from the prints and specs all information necessary for selecting materials, and for laying out and laying up the job.

Estimate to an accuracy of zero to +5 percent, the materials necessary for any unit of work designated on teacher-supplied prints and specs.

The students should be required to *use* the prints and specs daily in trade practice. Their use should be part of each new unit of instruction rather than a seemingly unconnected instructional entity.

Estimating should be taught as an inherent part of each unit of trade practice rather than as an instructional entity.

The student should practice estimating materials for each job before it is begun.

Labor estimation is beyond the entry level and so, beyond the level of this course. Motivated students who could benefit from this instruction should be so instructed, but not held accountable for proficiency therein.

SECTION III BRICK WORK

Suggested Time: 320 Hours

<u>CONTENT</u>	<u>OBJECTIVES</u>	<u>TEACHING SUGGESTIONS</u>
III - 1. JOB STATISTICS		
• Working conditions • Wages and benefits • Bricklayer's duties	The student should be: - Aware of probable employment prospects. - Acquainted with standard jobsite conditions. - Acquainted with current local wages and benefits. <i>The student should be able to:</i> - Demonstrate by oral or written test, a working knowledge of the duties of the entry-level bricklayer.	<i>Opaque projection</i> of newspaper "want ads," union literature, and Labor Department projections should be of value. The teacher must attempt complete objectivity when discussing relative strengths and weaknesses of union and non-union employment.
III - 2. HISTORY OF BRICK		
• Origins • Materials and processes	The student should be: - Acquainted with the history of brick. - Aware of the materials from which brick has been made.	<i>Earth and Fire</i>, a 16mm. film, should be of value.

III - 3. BRICK MANUFACTURE

- Process
 - Soft mud
 - Stiff mud
 - Dry press
- Curing
- Firing
- Types
 - Finish
 - . Face
 - . Common
 - Colors
- Sizes
 - Common
 - Jumbo
 - Norman
 - Roman
 - King Norman (Utility)
- Shapes
 - Rectangular
 - . Solid
 - . Cored
 - Bull nose
 - Splayed angle
 - Gauged

The student should be:

Acquainted with the three processes in manufacturing brick.

Aware that brick must be cured and then fired to become a durable building component.

Aware of the variety of brick available for construction.

Aware of the uses for the various shapes.

The student should be able to:

Demonstrate by any teacher-selected means, a working knowledge of the manufacture of brick.

Select from a representative sample, any teacher-designated types, sizes, and shapes.

Select from a representative sample, the shape required for a given teacher-specified use.

Demonstration:

Fire several cured brick.

Man and Masonry, 16mm. sound film.

Prologue in Masonry, 16mm. sound film.

Clay and Craftsmanship, 16mm. sound film.

The Student's Textbook, available from Structural Clay Products Institute, should be helpful.

III - 4. SAFETY

- Personal habits
- Group interaction
- Manipulation
 - Tools and equipment
 - Scaffolding
 - Building materials

The student should be:

Aware that his safety is of the utmost concern — to his employers as well as to himself.

Aware that the work habits of each person affect the safety of every other person.

Acquainted with accepted safe procedure in using and storing tools, equipment, and materials.

The student should be able to:

Demonstrate by continual behavior, a knowledge of, and proper attitude toward, good safety procedures.

Safety Knowhow in the Workshop, a 35mm. filmstrip, should be valuable.

The teacher must never violate safety regulations, nor deviate from accepted jobsite safety procedures when instructing or overseeing students.

The teacher must emphasize the safety aspects of each operation as it is taught.

III - 5. MORTAR

- Cementitious Materials
 - Portland Type I
 - Portland Blast Furnace Cement E
 - Portland Pozzolan C340
 - Slag Cement C358
 - Masonry Cement C91
 - Quick Lime C5
 - Hydrated Lime C207

The student should be:

Aware of the variety of cementitious components available.

Acquainted with the properties and uses of the common cementitious materials.

The student should remember the classification, properties, and uses of common cementitious materials through use rather than rote.

- Aggregates

Aware that sand must be clean, and the granules sharp and of a uniform size.

- Water

Aware that water must be clean and pure.

As a rule of thumb, mix water should be of equal quality with drinking water.

- Admixtures
 - Colors
 - Retarders
 - Accelerators
 - Antifreeze

- Mixing
 - Manual
 - Machine

- Retempering

- Testing
 - Water retention
 - Compression test

The student should be:

Aware that materials may be added to obtain colored mortar.
 Acquainted with the use of retarders and accelerators.
 Aware that true antifreezes in effective strength would seriously weaken the mortar.

Acquainted with the accepted procedures involved in mixing mortar manually and by machine.

Aware that mortar stiffened by evaporation rather than by hydration may be retempered rather than discarded.

Aware that mortar may be tested to insure quality.

The student should be able to:

Select from stock the materials required by furnished specifications.
 Mix mortar, manually and by machine, which conforms to field standards of quality.
 Demonstrate an entry-level ability to estimate batch size and mix frequency necessary to keep a varying number of bricklayers supplied, without mortar waste.

The student should understand why admixtures are used, and their benefits and disadvantages.

Safe operation of mixing machines should be emphasized.

It is not necessary that the students be proficient in performing tests of mortar quality, but they should know how they are done.

It is important that the student adjust mortar production to the consumption rate of the student bricklayers he is serving, rather than to a theoretical field rate.

III - 6. LAYING BRICK

- Methods
 - Eastern
 - Western

- Brick bond
 - Structural
 - . Running
 - . Common (American)
 - . Flemish
 - . English
 - . English Cross
 - . Random
 - Decorative
 - . Stack
 - . Herringbone
 - . Basketweave

- Mortar bond

- Jointing and finishing

- Joint styles
 - Flush
 - Concave
 - Weather
 - "V"
 - Raked
 - Struck
 - Strip

The student should be:

Acquainted with the two standard methods of setting brick in mortar.
Aware of the size trowel considered more efficient for each method.

Acquainted with both the sight and the spirit level methods of properly overlapping brick.
Acquainted with the various configurations used to form both structural and decorative brick bonds.
Aware of the need for and function of structural brick bonds.

Aware that mortar bond is the adhesion of mortar to masonry units or to the reinforcing steel.

Acquainted with the jointing and finishing operation.
Aware of when jointing and finishing is performed.

Acquainted with the various styles of joint.
Aware that the joint serves a decorative purpose, and compensates for variation in component dimensions, as well as functioning as the bond between components.

BRICK

Emphasize the critical importance of efficient teamwork in laying brick.

The student should be familiar with all the structural bonds, but should not be required to become proficient in laying those which modern construction methods have displaced.

All styles should be practiced.

Written tests for student knowledge of joints should be useful.

- Reinforcing,
anchoring, tying

- Types
 - . Duro-wall
 - . Wall ties
 - . "Z" ties
 - . Dove tails
 - . Steel rods
 - . Rectangular

The student should be able to:

Identify common brick bonds and joint styles among samples, either actual construction or A/V reproductions.

Demonstrate entry-level ability to lay out common bonds using both sight and spirit level methods.

Demonstrate by written or oral test, an understanding of the function and importance of mortar joints and of a good mortar bond.

Demonstrate an entry-level ability to lay brick using both methods, and selecting the trowel size proper for each method.

Demonstrate ability to select tools proper for the joint style required, and to perform jointing and finishing which will conform to field standards of quality.

The student should be:

Aware of the need for and purpose of reinforcements, ties, and anchors.

Acquainted with the various types of ties, anchors, and reinforcements available, and of the standard uses of each.

The student should be able to:

Demonstrate by written or oral test, understanding of the need and function of reinforcements, ties, and anchors.

At this level, proper procedure rather than speed is important.

The student should know which trowel is favored for each method, but should be permitted to use the one with which he functions best.

- Uses
 - . Joint reinforcement
 - . Facing to backup

The student should be able to:

Select from representative stock such reinforcements, anchors, or ties as are indicated on teacher-supplied specifications.

Install any common reinforcement, anchor, or tie to field standards of workmanship.

III - 7. WALLS — DESIGN CHARACTERISTICS

- Function
 - Masonry bearing wall
 - . Transverse
 - . Longitudinal
 - Skeleton frame bearing wall
 - . Veneered
 - . Cavity wall
 - . Masonry-bonded hollow wall
 - Nonbearing wall

The student should be able to:

Verbally or in writing, define bearing and nonbearing.

Verbally or in writing, describe the common structural designs used for each function.

The student should understand the difference in function and any resulting differences in design, materials, or procedures.

- Use
 - Fire walls
 - Parapets
 - Partitions
 - Retaining walls
 - Bearing walls
 - Curtain walls
 - Decorative screens
 - Party walls

Demonstrate by any teacher-selected means, a knowledge of the various uses of brick walls and of the identifying characteristics of each.

The teacher should select whatever method seems most effective: verbal description, written description, sketching, identification of photos, sketches, or plan drawings.

III - 8. LAYING CORNERS

- Preparation
 - Brick
 - Mortar pans

- Brick bonds

- Laying corners
 - Maintaining dimensions

- Holding plumb

- Masonry bonding

The student should be:

Aware of the importance of placing materials correctly for increased efficiency.

Acquainted with accepted methods of placing materials.

Acquainted with procedure for correctly starting corners, using each of the standard bonds.

Acquainted with both the ranging and story pole methods of maintaining vertical dimensions.

Aware of the critical need for maintaining plumb.

Acquainted with the correct bonding for walls of different wythes.

The student should be able to:

Set up for laying a corner.

Lay out for any standard bond.

Lay up a corner by ranging and by use of a story pole, the product conforming to field standards of quality.

Emphasize responsibility of corner men in checking corner heights against established bench marks.

Show how story pole can be used from an established point or by transfer of layout to the steel framing.

The use of reinforcing as bonding should be taught.

III - 9. WALL OPENINGS

- Layout
 - Windows
 - Doorways
 - Other

The student should be:

Aware of the critical importance of accuracy in laying out and constructing wall openings.

- Reinforcing

Acquainted with the use of angle iron, plates, and channels over wall openings.

Emphasize the existence of standards for size or iron in relation to size of opening.

- Flashing

Aware of the importance of flashing openings in exterior walls.

The student should be able to:

Lay out the bond for openings for a doorway, a window, and a small vent of specified size.

Demonstrate by written or oral test, an understanding of the functions of reinforcing and of flashing.

Lay up brick to construct the specified openings, the resulting work conforming to field standards of quality.

Demonstration:

Lay out the bond "dry" over openings to avoid "jumping" the bond.

III - 10. PIERS AND PILASTERS

- Function
- Layout

The student should be:

Aware of the function of piers and pilasters.

Acquainted with the standard construction of piers and pilasters.

Emphasize the importance of proper tie-in.

The student should be able to:

Demonstrate by written or oral test, an understanding of the function of piers and pilasters.

Lay up a section of wall including a pier and a pilaster, the resulting work conforming to field standards of quality.

III - 11. EXPANSION AND CONTROL JOINTS; FLASHINGS

- Function

- Materials

- Copper
- Aluminum
- Vinyl
- Other

- Installation

- Comparative costs
- Comparative durability
- Procedures

The student should be:

Aware of the function of flashings and of expansion and control joints.

Acquainted with the materials commonly used for these purposes, and the accepted methods of installation.

The student should be able to:

Demonstrate by written or oral test, an understanding of the functions of flashings and of expansion and control joints.

Demonstrate by written or oral test, a workman's knowledge of the properties and characteristics of the common materials.

Perform all work required for installation of flashings and of expansion and control joints, the product conforming to field standards of quality.

An unrestrained brick wall of 100 ft. length will, if its temperature is increased 100°F., increase its length by 3/8 in.

A wall which is not properly flashed will hold moisture, eventually damaging the brickwork.

Do not fail to instruct the student regarding mason/sheet metal union jurisdiction.

III - 12. ARCHES

• Function

The student should be:

Aware of the function of the arch.

The student should understand the importance of the *thrust* factor.

• Major types

- Jack
- Segmental
- Roman (Half-circle)
- Gothic
- Inverted

Acquainted with the construction of the major types.

The student should be able to:

Demonstrate by written or oral test, understanding of how the arch functions.

Opaque projection of photos and construction drawings, *overhead projection* of commercial or teacher-prepared transparencies, identification of local examples — all are useful methods.

• Construction

Identify by any teacher-selected means, each standard type arch.

Lay up each type arch, all work conforming to field standards of quality.

III - 13. BRICK STEPS

• Layout

- Rise
- Run
- Overhang
- Tread pitch

The student should be:

Acquainted with the use of the framing square in laying out unit rise and run.

Aware of the critical importance of maintaining rise height to $\pm 1/16$ in. throughout, and of *why* this is so important.

Emphasize stumbling block created by rises of uneven height and excessive or insufficiently pitched treads while explaining cold weather danger of too steep a pitch.

• Bond

Aware of the need for a limited amount of tread overhang and tread pitch, and of *why* it is needed.

• Construction procedure

The student should be able to:

Lay out the unit rise and run when given the total rise and run and the approximate riser/tread ratio desired.

Lay out the bond for constructing the steps, allowing overhang where necessary, and sufficient pitch.

Lay up the flight of steps, all work conforming to field standards of quality.

The student should successfully figure the layout for a number of different installations before attempting actual construction.

III - 14. FIREPLACES AND CHIMNEYS

- Footing

The student should be:

Aware that footing size must be in relation to chimney weight.

- Foundation

- Ash pit
- Clean-out door

Aware that chimney foundations, although frequently an integral part of the building foundation, must be strong enough to support chimney weight.

Acquainted with the standard location, use, and construction of ash pits and clean-out doors.

- Hearth

- Raised
- Flush

Acquainted with the use of a cantilevered, reinforced concrete slab as a base for an above grade hearth.

Aware that the back hearth must be constructed of fire brick and a fire clay and Portland cement mix.

Emphasize importance of keeping joints as tight as possible.

- Firebox
 - Fire brick
 - Prefabricated

The student should be:

Acquainted with the two types of firebox, and the advantages and disadvantages of each.

- Damper
 - Ratchet
 - Screw

Aware that prefabricated units include damper and smoke chamber. Acquainted with the function of the damper.

Emphasize 30° limit of smoke chamber inclination.

- Smoke chamber
 - Common brick
 - Prefabricated

Aware that the smoke chamber can be obtained prefabricated, or can be built of common brick.

- Chimney flue
 - Material
 - Size

Acquainted with the various sizes and shapes of flue lining.

The student should be informed of flue lining requirements of fire codes.

Aware of the direct relationship between the area of firebox opening and area of flue opening. Aware that chimneys must extend at least 2 ft. above roof ridge, to prevent downdrafts.

A 1:12 area relationship, flue opening to fireplace opening, is correct for chimneys which exceed 22 ft. from hearth to cap. A 1:10 ratio is correct for lesser heights.

- Chimney cap
 - Brick
 - Stone
 - Concrete

Aware of the need for, and function of, chimney caps. Acquainted with the common cap materials and the methods of construction.

The student should be informed of the advantages of a drip-edge cap.

- Flashing

Aware of the critical importance of flashing. Acquainted with the method of installing counter flashing.

Where practical, masonry and carpentry students should be instructed in flashing fabrication by the sheet metal instructor.

The student should be able to:

Demonstrate by any teacher-selected means, an ability to identify by name and function, all parts of a fireplace and chimney.

Lay up masonry for, and properly install, ash pits, clean-out doors, and ash dumps.

Demonstrate by any teacher-selected means, an entry-level understanding of the function of damper and smokebox and of the characteristics of the two types of firebox.

Design and use a template for constructing a fireplace firebox to receive a damper.

Construct a fireplace using each type firebox.

Lay up a chimney with flue linings and cap, counter flashing in place, as indicated on a supplied plan.

III - 15. BRICK PAVING

- Use
 - Patios
 - Walkways

- Base
 - Sand
 - Concrete

The student should be:

Aware of the use of brick as paving.

Acquainted with the two standard methods of construction.

Aware of the common patterns used.

Emphasize need for maintaining a straight surface slightly pitched to an outside edge.

Demonstrate by dry layout of the patterns.

- Patterns
 - Running bond
 - Herringbone
 - Basketweave

The student should be able to:

Lay any teacher-specified pattern in sand, the product conforming to field standards of quality.

Lay any teacher-specified pattern in mortar, the product conforming to field standards of quality.

III - 16. WASHING AND CLEANING

- Chemical
 - Muriatic acid
 - Soap solution
 - Dry powder

The student should be:

Acquainted with the various means of washing and cleaning brickwork.

Aware of the hazards inherent either in the materials used, the equipment used, or the application process.

Acquainted with the relative effectiveness of each method, and of other advantages and disadvantages.

Eye and pulmonary protective devices are mandatory.

Emphasize need to protect nearby surfaces and people from wind spray.

The student should be able to:

Demonstrate by written or oral test, an entry-level knowledge of standard washing/cleaning procedures and materials.

Safely mix and apply soap solutions and diluted acid.

Caution! The student should recognize muriatic as a commercial concentration of hydrochloric acid. In mixing, the *acid* must always be gently poured *into the water* in order to avoid spattering.

- Abrasive
 - Sandblasting

The student should know that sandblasting is normally for old, rough brickwork.

III - 17. BLUEPRINTS, SPECIFICATIONS, ESTIMATING

- Plans
 - Floor plans
 - Elevations
 - Sections
 - Details

The student should be:

Acquainted with the general layout and progression of construction blueprints and specifications.

Acquainted with the symbols, dimensioning, and other pertinent notations.

Aware of the meaning of line weights and the uses of sections and details.

- Specifications

Aware that specifications take precedence where they disagree with blueprint information.

- Estimating
 - Brick
 - . Modular
 - . Standard
 - . Roman
 - . Jumbo
 - . Norman
 - . Jumbo Norman
 - . King size
 - . Oversize jumbo
 - . Economy
 - Sand
 - Cement
 - Hydrated lime

Aware that brickwork is estimated by the square foot method.

Aware that the type brick to be used must be known before estimation is begun.

The student should be able to:

Demonstrate an entry-level ability to obtain from supplied plans and specs, any teacher-specified point of masonry information.

Demonstrate by day-to-day use an ability to select materials, set proportions, and lay out bonds, on the basis of plan and spec information.

Estimate materials needed when given plans and specs or a sketch showing dimensions, pattern, and type of brick.

Opaque projection of parts of prints or specs, in conjunction with individual student copies, is an effective method, but the student should gain proficiency by day-to-day use.

The student's knowledge of plans, specs, and estimating should not be limited to basics, but he should be judged on ability to locate and use information rather than on a degree of proficiency in using the plans and specs.

While the student should know how labor costs are estimated, proficiency in estimating should, at this level, be judged on materials estimation.

III - 18. MISCELLANEOUS OPERATIONS

- Caulking
 - Materials
 - Application

The student should be:

Aware of the need to seal openings in expansion and control joints, and around door and window frames. Acquainted with the materials and methods available.

The student should know that the bricklayer caulks only masonry or wood-to-masonry and metal-to-masonry.

- Cutting and Patching
 - Equipment
 - Procedure

Acquainted with the hand and power tools used to cut out old brick, and with the procedures used in patching.

The student should begin use of electric and pneumatic tools only after attaining competency with hand tools.

- Glass block
 - Mortar
 - Setting
 - . Expansion strip
 - . Reinforcing
 - Jointing and finishing

Aware that glass block is a nonload-bearing component.

Aware that a richer mix is needed, and that wire reinforcing should be used.

Aware that the higher coefficient of expansion of glass requires use of expansion strip between glass block and brickwork.

Acquainted with the method of making concave joints.

Emphasize that glass block must be handled carefully to avoid chipping.

The common bimetallic thermostat is a good demonstration of what occurs when materials of different expansion coefficients, bound together, undergo a change of temperature.

The student should be able to:

Identify by any teacher-specified means, the areas in which caulking is needed.

Use a caulking gun to seal joints in a representative variety of materials.

Use hand and power tools to cut out a section of brick.

Neatness as well as completeness of the seal should be judged.

The student should be able to:

Patch an existing wall, all work conforming to field standards of quality.

Lay up glass block in a prepared opening, all work conforming to field standards of quality.

The student should not be expected to match the mortar.

III - 19. TERMINOLOGY

The student should be able to:

Demonstrate by day-to-day use, by written or oral test, and by any other teacher-specified means, a working knowledge of trade terminology.

The teacher must use the correct term at all times. He must require continual usage by all students. Terminology should be learned through use rather than by rote.

SECTION IV STONE WORK

Suggested Time: 37 1/2 Hours

<u>CONTENT</u>	<u>OBJECTIVES</u>	<u>TEACHING SUGGESTIONS</u>
IV - 1. JOB STATISTICS		
• Working conditions • Wages and benefits • Stone mason's duties	The student should be: - Acquainted with standard jobsite conditions. - Acquainted with current local wages and benefits. - Aware of probable employment prospects. - Acquainted with the duties of the entry-level stone mason.	<i>Opaque projection</i> of photographs, "want ads," union literature and similar materials, and anecdotes from the teacher's own field experience should be an effective method.
IV - 2. HISTORY OF STONE WORK	<i>Suggested Time — 1 Hour</i>	
• Ancient • Contemporary	The student should be: - Aware of the long history of stone work. - Acquainted with the methods and materials involved in the development of stone work from prehistory to present. <i>The student should be able to:</i> - Describe orally or in writing, the general properties of stone which have made it an age-old favorite building material.	<i>Opaque projection</i> of photographs of drawings of Egyptian and Mayan pyramids, the Acropolis, the Colosseum and aqueducts, the Great Wall of China, Windsor Castle, and any number of post Renaissance structures discussed in relationship to the level of food, medicine, and weapons technologies of the times should have impact.

IV - 3. QUARRYING

- Locations
 - Local
 - World important

The student should be:

Aware of the variety of building stone available.

Aware that no geographical area produces more than a few distinct types.

Acquainted with the location of local and of the more important world centers of stone production.

Acquainted with the general quarrying process.

Films and slides are available from several commercial sources.

The student need not know where in Vermont marble is quarried, but should be aware of that state's position as a major producer.

- Operation
 - Equipment
 - Processes

The student should be able to:

List the types of stone produced locally.

List a teacher-specified number of types of stone commonly used in local construction.

Describe, orally or in writing, the general quarrying operation.

A field trip to a quarry or stone supplier's yard should be of value.

The student should know the general procedures — selecting cut lines; cutting with drills, flame drills, explosives, wire saws; moving the blocks from the quarry — rather than the job skills involved.

IV - 4. STONE CLASSIFICATION

- Igneous
 - Granite
 - Traprock

The student should be:

Aware of the means by which the three classes of stone were formed.

Acquainted with the major building stones in each classification.

Geology and Earth Science texts and audiovisuals should be of value.

Opaque projection of small samples under discussion is more effective than passing them around.

- Sedimentary
 - Limestone
 - Sandstone
 - Shale
- Metamorphic
 - Marble
 - Slate
 - Gneiss

The student should be able to:

Name the classes of stone.

Describe, orally or in writing, how each class was formed.

List and classify the major building stones.

Select by name from a representative sample, a specimen of each major building stone.

Visit a stone supplier's warehouse, if possible.

The student should learn sight-recognition through frequent contact rather than by memorizing lists of characteristics.

IV - 5. PROPERTIES OF STONE

- Physical
 - Strength
 - Durability
 - . Mechanical
 - . Chemical
- Economic
 - Initial cost
 - Maintenance
- Esthetic
 - Surface finish
 - Colors

The student should be:

Aware of the high resistance to compression and varying shear strength of the commoner building stones.

Aware of the widely varying resistance to abrasion and chemical decomposition.

Acquainted with the relatively high labor and materials cost of stone work.

Acquainted with the variety of textures which can be obtained in the face surface.

The effects of atmospheric chemicals should not be neglected.

Emphasize the differences in cost obtainable by use of different stone.

The effects of contact with copper, bronze, unprotected steel, and woods containing tannic acid should be emphasized.

A *trade* rather than a technical evaluation is required.

Samples of various stones should be available. These may be shop specimens, existing nearby structures, or stone cutters' stock.

The student should be able to:

Describe, orally or in writing, the general physical properties of the commoner building stones.

Demonstrate by oral or written test, an entry-level knowledge of the comparative cost of different stone and its setting.

List the commoner colors, textures, and surface finishes available.

IV - 6. COMMON USES AND PATTERNS

- Rubblework
 - Type
 - . Fieldstone
 - . Stratified stone
 - Pattern
 - . Coursed
 - . Random
 - . Nonstandard
 - Dry stone work
 - Veneer
- Ashlar
 - Face
 - . Sawed
 - . Split
 - Pattern
 - . Random
 - . Range
 - . Nonstandard
 - Veneer
 - . Bonding
 - . Metallic reinforcing
- Trimmings
 - Belt courses
 - Copings
 - Water tables
 - Sills
 - Lintels
 - Quoins
 - Ornamental
 - Curtain and flat walls

The student should be:

- Acquainted with the method of fitting stones in rubblework.
- Aware of the standards of acceptable fit for rubblework.
- Aware of the need to follow non-standard rubble patterns on occasion.
- Acquainted with the face textures available in ashlar stone.
- Acquainted with the bonding of the common ashlar patterns.
- Aware of the effects of the bond on product strength and appearance.
- Acquainted with the appearance of the finished rubble and ashlar patterns.

The student should be able to:

- Classify as rubble or ashlar and by bond type, any teacher-designated example of stone work.
- Demonstrate an entry-level ability to lay out the various stone bonds.
- Describe, orally or in writing, the way in which the bond affects the strength of ashlar.

The student should be:

- Acquainted with the various uses of trimmings.
- Aware of the practical as well as esthetic purposes of trimmings.

The student should be able to:

- Describe, orally or in writing, the uses and purposes of trimmings.
- Identify teacher-selected live samples or graphic representations of common trimmings.

Opaque projection of sketches, photographs, and prints should be of value.

Transparencies are available from several commercial suppliers.

Emphasize the importance of conferences to adapt impractical patterns supplied by owners.

Field trips to view examples of finished stone work should precede trips to see stone being set.

The examples may be graphic representations if actual work is not available.

Transparencies are available from several commercial suppliers.

A visit to a jobsite where trimmings are being set should be most valuable although an examination of existing work could be substituted.

- Flagstone and Slate
 - Cut flagstone
 - Irregular flagstone
 - Gauged slate
 - Irregular slate
 - Flagstone treads

The student should be:

Aware of stone shaping, sizing, and color formation.
 Acquainted with proper spacing and bonding, and with the manufacturer-supplied pattern for laying a floor.

Aware of the advantages of a one or two piece tread.

Pamphlets and brochures are available from several commercial suppliers.

The student should be able to:

Lay out a section of gauged slate floor, following the designed pattern of 10 square feet per carton.

Lay out a teacher-specified number of irregular slate and of flagstone, the cutting, bonding, and spacing conforming to field standards of quality.

State, orally or in writing, the advantages of a one or two piece tread.

IV - 7. SETTING STONE

- Mortar
 - Preparation
 - . Nonstaining cements
 - . Consistency
- Bonding
 - Cutting
 - Dressing

The student should be:

Acquainted with the different mortars used with specific stones.
 Aware that metamorphic stones will be stained by mortars containing certain cements.

Acquainted with the mortar consistencies necessary for setting various stones.

Aware of the affect of the bond on the appearance of the finished work.

Display samples of stained stone.

Instruction in this phase is limited to those tools, equipment, and methods commonly used while setting stone.

- Setting
 - Hand
 - Equipment aided
 - . Derrick
 - . Crane
- Protecting projecting surfaces

The student should be:

Acquainted with the methods and equipment used in cutting and dressing stone.

Acquainted with the methods and equipment used in setting stone — manually and with machine assistance.

Aware of the need to protect the edges of stone from damage and acquainted with the methods used.

The student should be able to:

Select components proper for, and mix mortar to a consistency correct for, any teacher-specified stone.

Cut and dress oversize stones to maintain bond using hand tools and small power equipment.

Demonstrate an entry-level ability to safely set stones in place — manually, and in cooperation with an equipment operator.

Lay up, to entry-level standards of quality, any teacher-specified type and pattern of stone work.

Demonstrate by any teacher-specified means, an understanding of the need to protect projecting stone work and of the methods used for protection.

Emphasize the hazards and inefficiencies inherent in use of poorly maintained tools, such as loose hammer handles, mushroomed chisel heads, and broken spirit level lenses.

The regulations requiring use of safety glasses must be strictly enforced.

The student should become proficient with the basic hand tools before using hydraulic or pneumatic equipment.

Emphasize the importance of close cooperation between the mason and the operator of equipment setting large pieces of stone.

A small sample section may be substituted for live work where necessary.

Transparencies on setting stone are available from commercial suppliers.

- Handling and storing stone

The student should be able to:
 Demonstrate by personal behavior and by any other teacher-specified means the approved manner of handling stone, and an understanding of the need and methods of protecting stone onsite.

Body mechanics in lifting, as well as covering to protect from paint and concrete splatter, should be emphasized.

STONE

IV - 8. WASHING AND CLEANING

- Manual processes
 - Muriatic acid
 - Soap solutions
 - Dry powders
- Machine processes
 - Sand blasting
 - Steam
- Special purpose
 - Wet sand
 - Wet aggregate

The student should be:
 Aware of the need for cleaning new work as well as existing structures.
 Acquainted with the more common cleaning agents and methods.
 Aware of the proper uses and relative advantages of each agent.

The student should be able to:
 List the commonly used cleaning agents giving at least one brand-name example of each prepared type.
 Describe, orally or in writing, the method of use for each commonly used agent.
 Describe, orally or in writing, the chief relative advantages and disadvantages of each commonly used cleaning agent, and any specific use for which it is intended.
 Demonstrate an entry-level ability to clean stone work using each of the manual and special purpose processes.

Emphasize the hazards inherent in use of acid. Enforce unfailing use of protective gloves, clothing, and face shield.

Manufacturers' advertising brochures and instruction pamphlets are available.

The teacher should refer to the agents by type, stating *several* brand names as examples of each.

Students should be informed of the highly specialized nature of steam cleaning work; that the wet sand process is used to remove paint and other surface coating; that the wet aggregate process is specifically for soft stone and ornamentation cleaning.

Proficiency in *use* of the machine processes may be required at the teacher's discretion.

IV - 9. BLUEPRINTS, SPECIFICATIONS,
ESTIMATING

- Interpreting
 - Prints
 - Specs
- Sketches
 - Plan view
 - Pictorial
- Estimating

The student should be:

Acquainted with the general layout and progression of construction blueprints and specifications.

Acquainted with stone symbols, dimensioning, and other pertinent notations.

Aware of the uses of sections and details.

Aware that specifications take precedence should they disagree with blueprint information.

Acquainted with the methods and processes necessary to estimating stone work materials.

The student should be able to:

Demonstrate by any teacher-specified means, an ability to equate stones and stone work with the standard plan symbols.

Demonstrate an entry-level ability to obtain from supplied prints and specs, any teacher-specified point of stone work information.

Demonstrate by a day-to-day use, the ability to select tools and materials, set proportions, and layout bonds on the basis of prints and specs information.

Estimate the materials needed when given prints and specs or a sketch containing the necessary information.

Opaque projection of sections of blueprint or specifications, in conjunction with individual student copies, is a valuable method.

The student should be judged on ability to locate and accurately interpret, rather than on any degree of proficient use of the papers.

SECTION V TILE WORK

Suggested Time: 75 Hours

<u>CONTENT</u>	<u>OBJECTIVES</u>	<u>TEACHING SUGGESTIONS</u>
V - 1. JOB STATISTICS		
• Working conditions • Wages and benefits • Job market	The student should be: Acquainted with standard jobsite conditions. Acquainted with current and projected local wages and benefits. Aware of probable employment prospects. <i>The student should be able to:</i> Demonstrate by oral or written test, a working knowledge of the duties of the entry-level clay tile mason.	Project/display "want ads," union literature, State and Federal employment projections. Discuss D.O.T. descriptions. Relate anecdotes from own industrial experience.
V - 2. HISTORY OF TILE		
• Origin • Development	The student should be: Aware of the great antiquity of some forms of clay tile construction. Acquainted with the development of special use types to meet the ever increasing need for materials possessing specific properties. Aware of the varied uses of clay tiles in current construction.	The student need not be tested on this background information.

V - 3. GLAZED TILE

- Manufacture
 - Materials
 - Processes
 - Sizes and shapes
 - Tolerances
- Utilization
 - Layout of base course
 - . Cove base
 - . Regular tiles
 - Establishing bond
 - . Stacked
 - . Running
 - Setting tile
 - . Mortar
 - . Cutting
- Finishing
 - Jointing and cleaning
 - Washing

The student should be:

Acquainted with the materials and processes involved in the manufacture of glazed tile.

Acquainted with the sizes and shapes available.

Aware of the extremely close tolerances required in manufacturing glazed tile.

Acquainted with the methods of laying out and installing glazed tile.

Aware of the critical importance of maintaining plumb.

Acquainted with the procedures of cutting, setting, finishing, and washing.

The student should be able to:

Demonstrate by oral or written test, an entry-level knowledge of the properties and uses of glazed tile.

Lay out the tile bond — cove base and regular, stacked and running.

Mix, or supervise the mixing of, mortar of correct richness.

Cut, set, joint and clean, and wash a section of glazed tile, all work conforming to field standards of quality.

The student should know why tile is the best material for certain uses.

Display accessory shapes.

Describe problems which could result from possible size variation.

Alert students to the possibility of variations between cove and regular tiles. Display examples.

Emphasize the importance of teamwork in setting glazed tile.

Emphasize that jointing and cleaning is a single operation, but polishing and mitering of joints is done after cleaning.

Emphasize the need for richer mortar, due to the higher density of tile.

V - 4. ARCHITECTURAL TERRA COTTA

- Manufacture
 - Types
 - . Extruded block
 - . Ornamental
 - Processes
 - . Materials
 - . Colors
 - . Sizes

- Purposes
 - Load bearing
 - Non bearing
 - . Partition
 - . Furring
 - . Fireproofing
 - . Speed tile

- Installation
 - Layout
 - Setting
 - . Mortar
 - . Cutting

The student should be:

Acquainted with the materials and processes used in manufacture of terra cotta.

Aware of the variety of uses to which terra cotta is put.

Aware of the variety of terra cotta units available.

Acquainted with the procedures of laying out and setting terra cotta.

The student should be able to:

Demonstrate by oral or written test, an entry-level knowledge of the varieties and uses of architectural terra cotta.

Select from a representative sample of masonry units, any teacher-specified variety of architectural terra cotta.

Lay out and set a section of architectural terra cotta to teacher-supplied specifications, all work conforming to field standards of quality.

Display samples of textured, natural, and glazed finish terra cotta.

Emphasize the large number of colors available, and the relatively large size of these units.

Show samples of load-bearing and nonload-bearing terra cotta, prepared to display their structural difference.

V - 5. FACING TILE (CERAMIC)

- Manufacture
 - Process
 - . Materials
 - . Tolerances
 - . Shapes and sizes

The student should be:

Acquainted with the materials and processes used in manufacturing facing tile.

Aware of the close tolerances adhered to in manufacturing.

It should be understood that the installation of facing tile is usually a specialized field.

- Utilization
 - Layout
 - Cutting
 - Setting
 - . Concrete
 - . Mastic

The student should be:

Aware of the variety of units available, and of the uses of facing tile.

Acquainted with the methods of laying out, setting, and finishing facing tile.

The student should be able to:

Demonstrate by any teacher-specified means, an entry-level knowledge of manufacture of facing tile, and of the variety of units available.

Lay out, set, and finish a section of facing tile, all work conforming to field standards of quality.

V - 6. MISCELLANEOUS TYPES

- Quarry flooring
 - Shapes and sizes
 - Installation
- Vitreous copings
 - Shapes and sizes
 - Installation
- Flue linings
 - Shapes and sizes
 - Installation
 - . Cutting
 - . Setting

The student should be:

Aware of the existence of quarry flooring and vitreous copings.

Acquainted with the variety of vitreous copings and quarry tile available, and with their uses.

Aware of the mandated use of flue linings.

Acquainted with the standard sizes and shapes of flue lining.

Acquainted with the process of cutting and setting flue tile.

The student should be able to:

Cut any given flue tile to any teacher-specified length.

The student should know that the use of quarry tile and vitreous copings is increasing in many areas. He should know the meaning of *vitreous*.

Requiring student proficiency in setting quarry tile and vitreous copings is at the teacher's discretion.

V - 7. BLUEPRINTS, SPECIFICATIONS,
ESTIMATING

• Symbols

The student should be:

Acquainted with the standard
symbols for various clay tiles.

• Specifications

Acquainted with the manner in which
the various clay tile specifications
are written, and with their location
in the specs.

• Materials estimation

- Type
 - . Structural
 - . Facing
- Method
 - . Square foot
 - . Lineal foot

The student should be able to:

Determine where clay tile units are
required by interpretation of
symbols on a teacher-supplied
blueprint.

Identify the size, shapes, types, and
colors of the required units, by
use of teacher-supplied specifi-
cations.

Estimate to an accuracy of ± 5 percent
the amount of clay tile needed for
any teacher-specified section of work.
Prepare a purchase list of these
materials.

Sketches may be used initially
to minimize confusion, but
ultimately the student must work
from standard prints and specs.

The student should begin esti-
mating a small area of the total
work, increasing the area and
diversity of materials as skill
increases.

The list need not be a partic-
ular form, but must show all
information in the standard
order.

SECTION VI PLASTER WORK

Suggested Time: 12 1/2 Hours

<u>CONTENT</u>	<u>OBJECTIVES</u>	<u>TEACHING SUGGESTIONS</u>
VI - 1. JOB STATISTICS • Working conditions • Wages and benefits • Job market	The student should be: - Acquainted with standard jobsite conditions. - Acquainted with current and projected local wages and benefits. - Aware of probable employment prospects. <i>The student should be able to:</i> - Demonstrate by oral or written test, a working knowledge of the duties of the entry-level plasterer.	Project/display "want ads," union literature, State and Federal employment projections. Care must be taken to maintain strict objectivity in discussing union/nonunion employment. Relate anecdotes from personal industrial experience. Films are available from commercial suppliers.
VI - 2. HISTORY OF PLASTERING • Ancient • Recent	The student should be: - Aware of the great antiquity of plastering. - Acquainted with the development of plasters providing specific desired qualities.	The student need not be tested on this background knowledge. Projection of photographs of plastered structures, ranging from wattle and adobe through 19th century European to contemporary American, should be valuable.

VI - 3. PREPARATION OF PLASTER

• Components

- Water
- Sand
- Fiber
 - . Jute
 - . Sisal
 - . Hair
 - . Wood
- Cementitious
 - . Lime
 - Hydrated
 - Slaked
 - . Gypsum
 - Plaster of paris
 - Keene's cement
 - . Cement
 - Portland
 - Portland-pozzolana
 - . Prepared gypsum mixes
- Mineral aggregates
 - . Expanded mica
 - . Other

• Types of plaster

- Acoustic
- Bonding
- Sand float finish
- Fibered gypsum
- Fire resistant
- Lightweight
- Set coat
- Stucco
 - . White
 - . Colors

The student should be:

- Aware of the nature of the basic components of plaster.
- Acquainted with the many variations of some basic components.
- Acquainted with the different properties of plasters obtained from use of the various components.
- Aware of the effects of oil, vegetable matter, and other impurities in the mix.
- Acquainted with the uses of the types of plasters.
- Aware of the color inconsistencies caused by differing rates of absorption of the base surface.

The student should be able to:

- List the basic components of plaster.
- List the various common optional components, describing the general effects produced by each.
- List the uses of the commoner optional component mixes.
- Demonstrate by day-to-day behavior an understanding of the need for clean, properly maintained tools and equipment.
- Demonstrate an ability to mix sand and neat plaster, lime and gauging plaster, in correct proportions and to proper working consistency.

Emphasize the sufficiency of water and one cementitious material as plaster — fiber, sand, additional cementitious materials being added or not to obtain specific properties in the plaster.

Emphasize the importance of using only clean equipment and clean, pure water.

The number of components listed and related effects described must be fixed by the teacher when developing his instructional objectives.

Films are available from several commercial suppliers.

At this level the student should be required to know components/proportions for only the basic mixes.

- Mixing

VI - 4. APPLICATION

- Base surfaces
 - Gypsum lath
 - Expanded metal
 - Wire lath
 - Masonry
 - . Block
 - . Tile
 - . Concrete
- Guides
 - Screeds
 - Dots
 - Grounds
- Systems
 - Three coat
 - . Scratch
 - . Brown (Float)
 - . White (Set)
 - Two coat
 - . Brown
 - . Finish

The student should be:

Acquainted with the common surfaces which serve as a base for plaster, and with their individual properties.

Aware of the standard means of maintaining straight surfaces and specified thickness.

Acquainted with the standard, current methods of applying plaster to the various base surfaces.

Acquainted with the use of the miter tool and gauge in cornice work.

The student should be able to:

Identify by name each of the common base surfaces in a teacher-supplied representative sample.

Describe, orally or in writing, and state the purpose of screeds, dots, and grounds.

Prepare a given amount of any teacher-specified plaster.

Emphasize the importance of following *exactly* all manufacturers instructions for using prepared mixes.

Emphasize the advantage in using prepared color mixes rather than adding coloring agents onsite.

Samples of base materials and literature supplied by the manufacturers should be displayed.

Effective visual aids can be constructed by plastering sections of common bases so that each successive layer leaves a portion of the preceding layer exposed.

The student should be capable of checking guides for straightness and plumb. It is not necessary that he be able to install them.

Emphasize the importance of teamwork between masons applying plaster to a single surface area.

- Thin wall
- Cornice and ornamental

The student should be able to:

Plaster any teacher-specified base surface, by any standard system, all work conforming to entry-level standards of quality.

Prepare and set a section of cornice or ornamental work.

VI - 5. BLUEPRINTS, SPECIFICATIONS, ESTIMATING

- Interpreting
 - Prints
 - Specs
- Estimating

The student should be able to:

Demonstrate by any teacher-specified means, an ability to identify plastering symbols.

Demonstrate an entry-level ability to obtain from supplied prints and specs, any teacher-specified point of plastering information.

Demonstrate by day-to-day use, the ability to select tools and materials, set proportions, and apply plaster on the basis of print and spec information.

Interpret specifications' room schedules.

Estimate the materials needed, when given prints and specs or a sketch containing the necessary information.

Texts and sample prints and specs are available from several publishers.

Opaque projection of sections of blueprint or specifications, in conjunction with individual student copies, is a valuable method.

The student should be judged on ability to locate and accurately interpret, rather than on any degree of proficient use of the papers.

RESOURCE LIST

TEXTS, REFERENCES, MANUFACTURERS BOOKLETS

- American Concrete Institute. *The structural performance of concrete masonry walls*. The Institute.
- American Society for Testing and Materials. *Tests of the stability of concrete masonry walls*. The Society.
- Dalzell, R. J. & Townsend, Gilbert. *Masonry simplified, vols. I, II*. Chicago. American Technical Society. 1966
- Delmar Publishers, Inc. *Basic blueprint reading*. Albany. The Corporation.
- *Bricklaying I, II, III; teacher's manual*. Albany. The Corporation. 1952.
- *Concrete technology*. Albany. The Corporation.
- *Construction estimating*. Albany. The Corporation.
- *Mathematics for masonry trades*. Albany. The Corporation.
- Hepler, D. E. & Wallach, P. I. *General architectural drawing*. 2d ed. New York. McGraw-Hill. 1971.
- Louisville Cement Co., Inc. *Specifications recommended to secure dry brick walls; AIA file no. 5-M*.
Louisville, Ky. The Corporation. 1952.
- *Type of workmanship recommended for concrete block walls; AIA file no. 10*. Louisville, Ky. The Corporation. 1953.
- *Type of workmanship recommended to secure dry brick walls; AIA file no. 5-A*. Louisville, Ky. The Corporation. 1951.
- National Concrete Masonry Association. *Concrete masonry*. Washington, D.C. The Association.
- *Concrete masonry slope paving under bridges*. Chicago. The Association.
- *Design data on concrete joist/concrete filler block floors*. Arlington, Va. The Association.
- *Shadowal construction masonry*. Arlington, Va. The Association.
- Portland Cement Association. *Concrete basements for homes; P37-2*. Chicago. The Association. 1954.
- *Concrete construction practices; ST105*. Chicago. The Association. 1966.
- *Concrete masonry handbook; P27-3*. Chicago. The Association. 1951.
- *Forms for architectural concrete; T21-3*. Chicago. The Association. 1952.
- *Fundamental facts about concrete; ST101*. Chicago. The Association. 1966.
- *Portland cements; ST92-2*. Chicago. The Association. 1966.

RESOURCE LIST

- Structural Clay Products Institute. *Bricklaying vocational training: instructor's guide, student's textbook, study guide*. Washington, D.C. The Institute. 1965.
- Theodore Audel and Company. *Mason's and builder's guide, vols. I, II, III, IV*. Indianapolis, Ind. H.W. Sams & Co., Inc. 1965.
- University of Illinois. *Strength and stability of concrete masonry walls; bulletin no. 251*. Urbana, Ill. Engineer Experiment Station.
- Wyatt, William E. *General architectural drawing*. Peoria, Ill. Chas. A. Bennett Co., Inc. 1969.

SOUND FILMS — 16mm.

- Building for safety*. Underwriters Laboratories. 15 min. color.
- Building with prestressed concrete*. Barbre Productions. 30 min. color.
- Clay and craftsmanship*. Structural Clay Products. 20 min. color.
- Concepts in concrete*. Ideal Cement Company. 29 min. color.
- Earth and fire*. Structural Clay Products. 12 min. color.
- Foundations and concrete*, MN-6719A. Department of the Navy, Building Techniques Series. 26 min. b & w.
- Futures in concrete*. Ideal Cement Company. 14 min. color.
- Inside story of concrete*. U.S. Army, Corps of Engineers. 14 min. color.
- Lightweight champion*. Zonolite. 18 min. color.
- Man and masonry*. Structural Clay Products. 15 min. color.
- New dimensions in concrete*. Ideal Cement Company. 29 min. color.
- New horizons in plastering*. Vermiculite Institute. 20 min. color.
- Prologue in masonry*. Structural Clay Products. 24 min. color.

FILMSTRIPS — 35 mm.

- A B C's of building codes*. U.S. Department of Housing and Urban Development. 13 min., b & w.
- Safety knowhow in the workshop*. Society for Visual Education. 55 fr., color.

TRANSPARENCIES

Architectural drafting transparencies; nos. 28281, 28289. McGraw-Hill.

Hand hoist and sling for heavy stones; BSM-53. DCA Educational Products.

House types; no. 15-0861-3 (printed original, no. 15-0361-4). Visual Products Division, 3M Company.

Stone cutting; BSM-52. DCA Educational Products.

Stonemason's tool kit; BDM-51. DCA Educational Products.

Stone quoins; BSM-56. DCA Educational Products.

Stone wall patterns; BSM-56. DCA Educational Products.

SLIDES

Foundations for your home; HD54. Cornell University Film Library.

Story of structural slate. Vermont Structural Slate Company. Text included.

CHARTS AND TABLES

Aggregates for masonry mortar; Table no. 14. Portland Cement Association.

Recommended mortar mixes; Table no. 15. Portland Cement Association.

Recommended practices for selecting proportions for concrete; Chart no. 613-54. American Concrete Institute.

SOURCE DIRECTORY

American Concrete Institute
P.O. Box 4754 Redford Station
Detroit, Michigan 48219

American Society for Testing and Materials
1916 Race Street
Philadelphia, Pennsylvania 19103

American Technical Society
848 East 58th Street
Chicago, Illinois 60637

Barbre Productions, Inc.
2130 South Bellaire Street
Denver, Colorado 80222

Brick Klenz
Klenzade Products
Madison, Wisconsin 53701

Chas. A. Bennett Co., Inc.
809 West Detweiller Drive
Peoria, Illinois 61614

DCA Educational Products, Inc.
4865 Stenton Avenue
Philadelphia, Pennsylvania 19144

Delmar Publishers Division
Litton Educational Publications, Inc.
P.O. Box 5087
Mountainview Avenue
Albany, New York 12205

Dur-o-wall Products, Inc.
P.O. Box 628
Syracuse, New York 13201

Ideal Cement Company
Denver, Colorado 80202

Louisville Cement Company
501 South Second Street
Louisville, Kentucky 40202

McGraw-Hill Book Company
Webster Division
Manchester Road
Manchester, Missouri 63011

National Concrete Masonry Association
1015 Wisconsin Avenue N.W.
Washington, D.C. 20036

Portland Cement Association
33 West Grand Avenue
Chicago, Illinois 60076

Saf-T-Klenz
Berman Chemical Company
1916 North 12th Street
Toledo, Ohio 43624

Society for Visual Education
1345 West Diversey Parkway
Chicago, Illinois 60614

Sure Kleen 101
Process Solvent Company
1040 Chelsea Trafficway
Kansas City, Kansas 66104

Structural Clay Products Institute
1520-18th Street N.W.
Washington, D.C. 20036

Theodore Audel & Company
Division of H.W. Sams & Company, Inc.
4300 West 42d Street
Indianapolis, Indiana 46206

Underwriters Laboratories, Inc.
Walt Whitman Road
Melville, New York 11749

United States Army, Corps of Engineers
Waterways Station
P.O. Box 631
Vicksburg, Mississippi 39181

University of Illinois
Urbana, Illinois 61801

Vermiculite Institute
208 South LaSalle Street
Chicago, Illinois 60604

Vermont Structural Slate Company, Inc.
Fair Haven, Vermont 05743

Zonolite Division
W.R. Grace & Company Film Section
135 South LaSalle Street
Chicago, Illinois 60603

SUGGESTED EQUIPMENT

The suggested equipment is considered to be the minimum necessary for proper instruction in trade masonry as outlined in this syllabus. Some variation and some additions are expected, to allow for teacher preferences and local employment conditions. The number of units of each item is formulated on the basis of a class load of 15 students per teaching session — additional students requiring a proportional increase in the number of some items.

EQUIPMENT

1	Brick and tile barrow	20	Pipe scaffold section
1	Brick saw; diamond blade, face shield	100	Scaffold plank
3	Brick tongs	1	Screed; magnesium, 12 ft.
1	Builders level, or transit	3	Shop broom
1	Bull float	2	Shovel; flat, long handle
1	Concrete mixer; gasoline powered	2	Shovel; flat, short handle
3	Contractor's wheel barrow	4	Sled runner; 3/4 in. x 14 in.
2	Mixing hoe	4	Sled runner; V-joint, 14 in.
10	Mortar board, or pan	1	Stone splitter; hydraulic
10	Mortar board stand	1	Troweling machine; power
2	Mortar box; mixing	5	Washdown pail; rubber
1	Mortar mixer; gasoline powered	2	Water hose; rubber, 3/4 in. x 50 ft.

INDIVIDUAL EQUIPMENT (Personal items — shoes, clothing — are the students' responsibility.)

15	Boots; rubber	15	Safety helmet
15	Gloves; rubber	15	Slicker
15	Safety glasses, sideshielding		

TOOLS

5	Angle float; stainless steel	2	Chalk box, w/chalk
5	Angle paddle	5	Chisel; carbide tip
15	Brick hammer; steel shank, 24 oz.	2	Concrete darby; magnesium, mahogany
15	Brick set	5	Concrete edger
15	Brick trowel	5	Concrete finishing trowel
2	Bolt cutter	5	Concrete float; magnesium
5	Browning brush	5	Concrete jointer
2	Caulking gun	5	Cork float

TOOLS (CONTINUED)

5 Float; redwood
 2 Floor scraper
 20 Glazed tile hammer
 2 Handsaw; crosscut, 8 pt.
 2 Hatchet; steel shank
 5 Inside corner trowel
 15 Jointer; concave, 3/8 in. - 1/2 in.
 15 Jointer; concave, 5/8 in. - 3/4 in.
 15 Jointer; skate wheel
 2 Lather's snips
 5 Lump hammer; mashing, 3 lb.
 15 Mason's line holder, w/nylon line
 6 Pitching chisel
 10 Plastering hawk
 5 Plastering trowel
 5 Plumb bob; 10 oz.
 5 Point chisel
 15 Pointing trowel
 5 Rubber hammer

5 Rubbing stone
 15 Rule; zig-zag, 6 ft., wood, mason's/modular
 15 Set line blocks; wood or plastic
 15 Set line holder; block
 15 Set line pins
 15 Set line twigs
 15 Spirit level; brass bound or magnesium, 2 ft.
 15 Spirit level; brass bound or magnesium, 4 ft.
 5 Sponge rubber float
 10 Steel square; 18 in. x 24 in.
 10 Stone chisel; toothed
 5 Stone facing hammer
 2 Tape measure; steel, 12 ft.
 2 Tape measure; steel, 100 ft.
 15 Tool bag; canvas
 15 Washdown brush; regular
 2 Wire nipper
 2 Wrecking bar; goose neck, 30 in.